



Intensive Care - practice

- 2 weeks' lecture
- You need: white coat, ID Card, (shoe to change)

Practical Info

- Final Test – (20 questions, each has 5 answers)
- Exams – oral (2 sections)
- Evaluation forms

What you should know after the practise?



1) ALS

2) Managing unstable patient

3) Oral Case Presentation

4) Assesing ABG + Organ Dysfunction + ECG + X-rays and CT scans

1st week

Day of the week	Time	Topic	
Monday	Public Holiday		
Tuesday	10:15-12:30	Intensive Care - introduction, history, ABCD approach, late critical care)	
		ALS+4H+4T+ (postresuscitation care: sedation, hypothermia)	
		Bed-side practical lecture	
Wednesday	10:15-11:00	Group rotation	SimMan – simulation
	11:00-11:45		Training ALS skills
	11:45 - 12:30		Bed-side practical lecture – oral case presentation
Thursday	10:15-11:00	Oxygenation failure -diagnostic approach to dyspnea, oxygenotherapy + ARDS	
	11:00-11:45	Ventilation failure - non-invasive ventilation, basics of arteficial ventilation, COPD+Severe Asthma	
	11:45 - 12:30	Bed-side practical lecture	
Friday	10:15-12:30	KDAR FN Brno Children's Hospital (Černopolní 9, Brno)	

2nd week

Day of the week	Time	Topic
Monday	10:15-11:00	Shock patient (Haemodynamic, monitoring, fluids, vasoactive drugs)
	11:00-11:45	Acid-Base Disorders+Sodium and Potassium Disorders
	11:45 - 12:30	Bed-side practical lecture
Tuesday	10:15-11:00	Acute Liver Failure+Delirium
	11:00-11:45	Acute Kidney Injury
	11:45 - 12:30	Bed-side practical lecture
Wednesday	10:15-11:00	Severe Trauma + Major Bleeding + Haemotherapy
	11:00-11:45	Brain Trauma - Brain Oedema-Intracranial Hypertension-Brain Death and Organ Donation
	11:45 - 12:30	Bed-side practical lecture
Thursday	10:15-12:30	Group rotation
		SimMan – simulation
		Testing ALS skills
Friday	10:15-11:00	Sepsis+MODS (Hospital-acquired infections)
	11:00-11:45	Palliative Care + End-of-Life Decissions, Life-Sustaining Treatment)
	11:45 - 12:30	Discussion, credits and TEST

WHAT IS INTENSIVE CARE?



Mortality 90%



Monitoring of ventilation:

- periodic samples of arterial blood
- pH, using new electrodes for total CO₂ measurement by Van Slyke
- pCO₂ was calculated from the Henderson-Hasselbalch equation

Then the students were given instructions how to change the frequency and intensity of breathing!

April 26, 1952

dr. Bjorn Ibsen performed a tracheotomy to a 12-year-old girl with poliomyelitis

Introduced cannula with cuff and connected to the system with positive pressure ventilation

A total of 315 patients requiring ventilatory support

1,500 medical students, a total of 165,000 hours, shifts per 6 hours

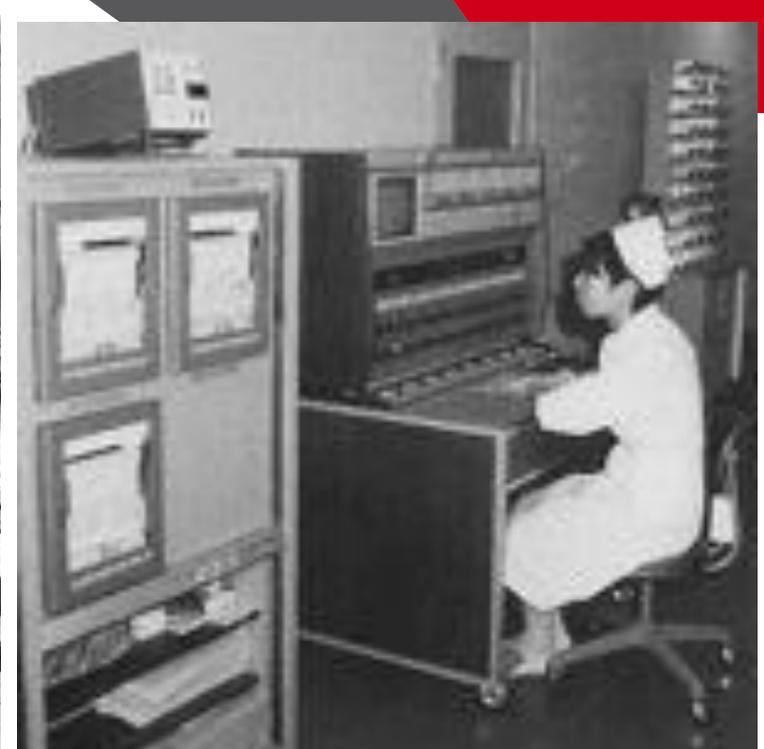
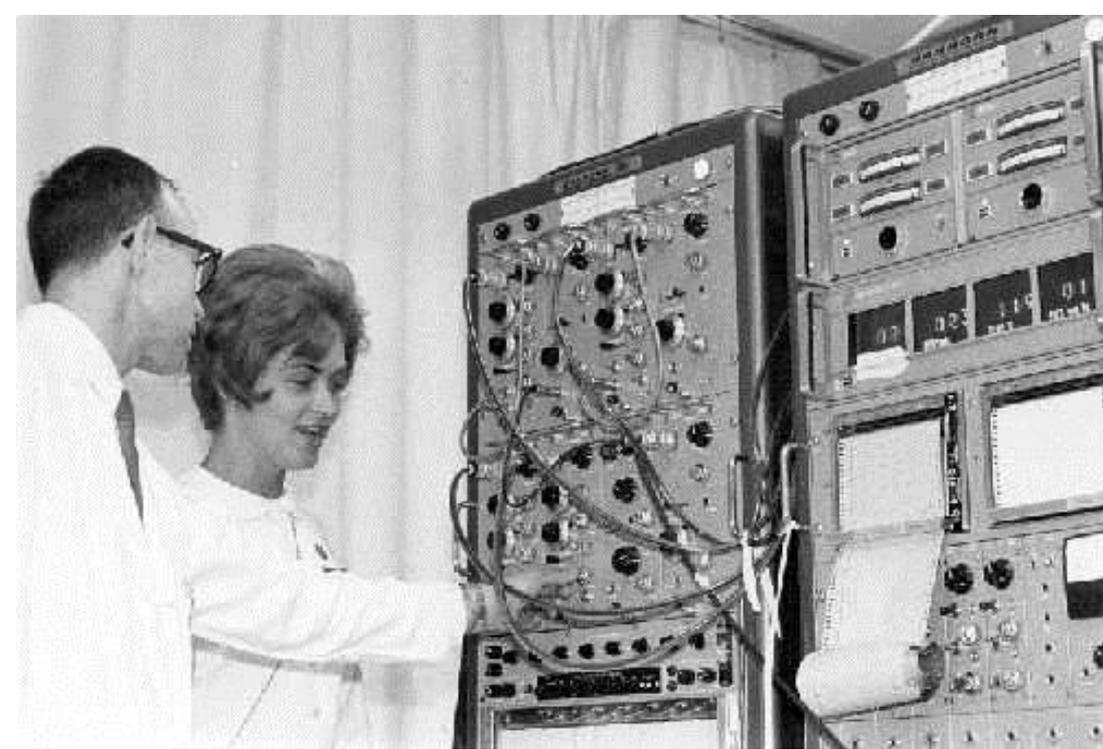
2-3 months to restore breathing

Mortality declined from 90% to 25%

Mechanical Students

Carl-Gunnar Engström

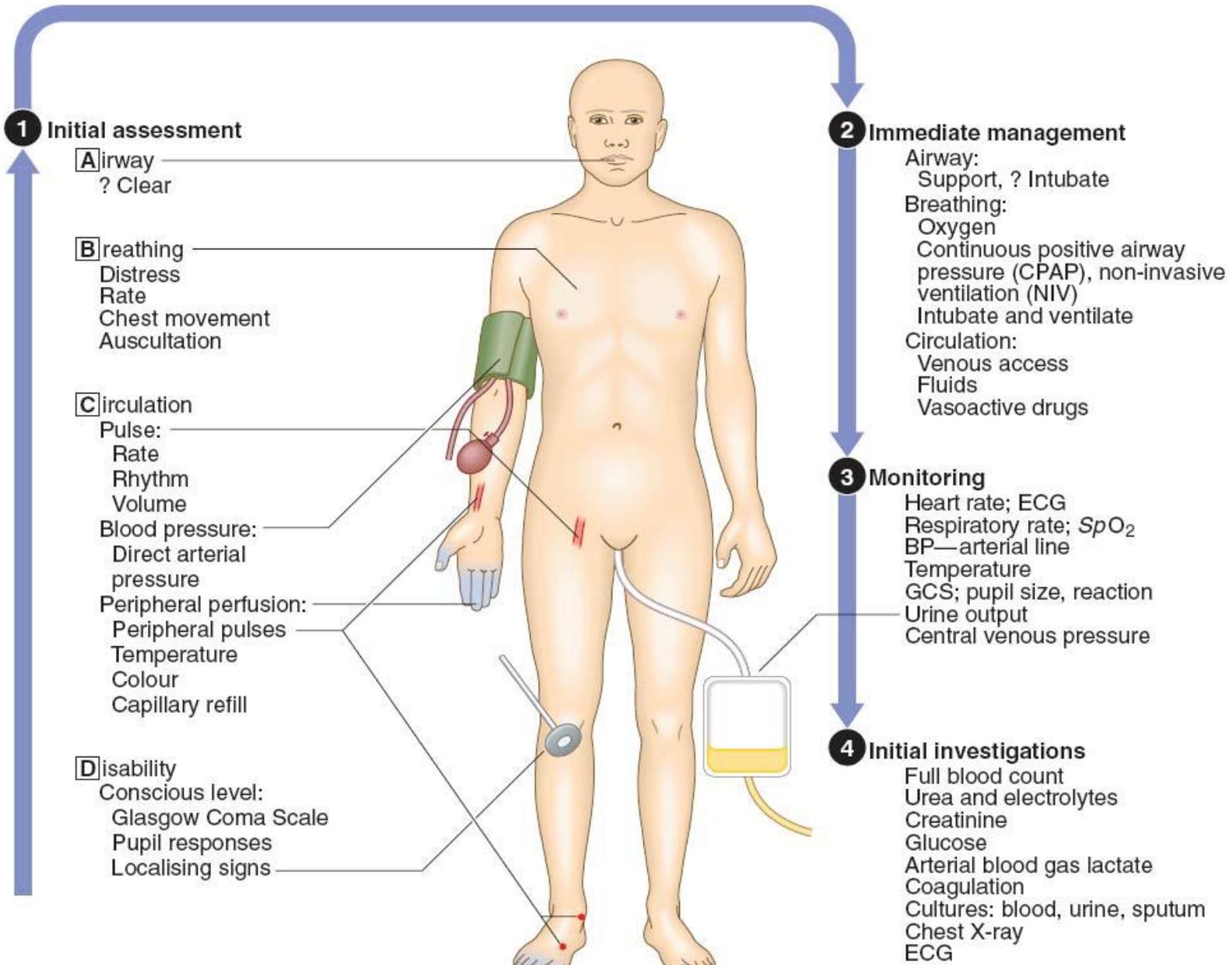




<http://www.uphs.upenn.edu/paharc/collections/gallery/departments/ICU.html>

1967 – first ICU monitor in Japan

CLINICAL EXAMINATION OF THE CRITICALLY ILL PATIENT



FAST HUGS BID

- Feeding/fluids
- Analgesia
- Sedation
- Thromboprophylaxis
- Head up position
- Ulcer prophylaxis
- Glycemic control
- Spontaneous breathing trial
- Bowel care
- Indwelling catheter removal
- Deescalation of antibiotics

Vincent WR 3rd, Hatton KW. Critically ill patients need “FAST HUGS BID” (an updated mnemonic). Crit Care Med. 2009 Jul;37(7):2326-7

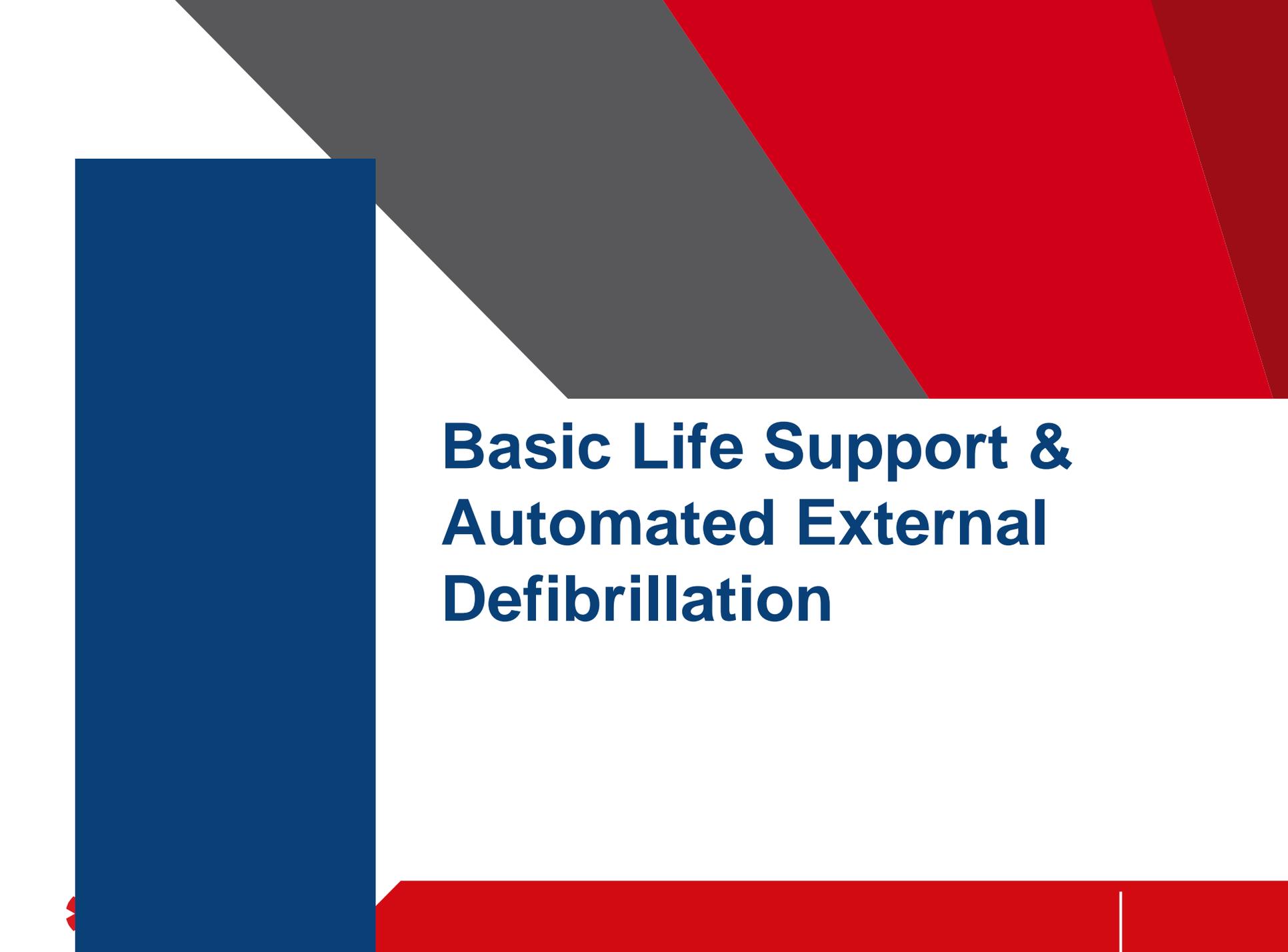
ABCD-approach

A – airway
B – breathing
C – circulation
D – disabilities
E – electrolytes
F – fluids
G – gut, glycaemic control
H – hematology
I – infections
L – lines
M – medication
N – nutrition
O – others
R – renal

- <https://youtu.be/KNqoXboSVUI>

ABC of late critical care

- **AWAKENING**
- **BREATHING**
- **COORDINATING/CHOICE**
- **DELIRIUM MONITORING/MANAGEMENT**
- **EARLY MOBILITY/EXERCISE**



Basic Life Support & Automated External Defibrillation

BACKGROUND

- Approximately 700,000 cardiac arrests per year in Europe
- Survival to hospital discharge presently approximately 5-10%
- Bystander CPR is vital intervention before arrival of emergency services
- Early resuscitation and prompt defibrillation (within 1-2 minutes) can result in >60% survival



Approach safely

Check response

Shout for help

Open airway

Check breathing

Call 112

30 chest compressions

2 rescue breaths



BLS

- D = danger
- R = response (AVPU scale)
- S = shout / send / call for help

- A = airway
- B = breathing
- C = circulation

APPROACH SAFELY!

	Approach safely
Scene	Check response
Rescuer	Shout for help
	Open airway
Victim	Check breathing
Bystanders	Call 112
	30 chest compressions
	2 rescue breaths

CHECK RESPONSE



Approach safely

Check response

Shout for help

Open airway

Check breathing

Call 112

30 chest compressions

2 rescue breaths

CHECK RESPONSE

Alert-Voice-Pain-Unresponsive



©EKC

A

The patient is awake.

V

The patient responds to verbal stimulation.

P

The patient responds to painful stimulation.

U

The patient is completely unresponsive.

SHOUT FOR HELP



Approach safely

Check response

Shout for help

Open airway

Check breathing

Call 112

30 chest compressions

2 rescue breaths

OPEN AIRWAY



Approach safely

Check response

Shout for help

Open airway

Check breathing

Call 112

30 chest compressions

2 rescue breaths

©ERC

CHECK BREATHING

Approach safely

Check response

Shout for help

Open airway

Check breathing

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30 chest compressions

2 rescue breaths



©ERC

CHECK BREATHING

- Look, listen and feel for NORMAL breathing
- Do not confuse agonal breathing with NORMAL breathing



©ERC

AGONAL BREATHING

- Occurs shortly after the heart stops in up to 40% of cardiac arrests
- Described as barely, heavy, noisy or gasping breathing
- Recognise as a sign of cardiac arrest

Gasping . . .

http://www.youtube.com/watch?feature=player_detailpage&v=ICODRFoWZkw#t=73s





Approach safely

Check response

Shout for help

Open airway

Check breathing

Call 112

30 chest compressions

2 rescue breaths

30 CHEST COMPRESSIONS



Approach safely

Check response

Shout for help

Open airway

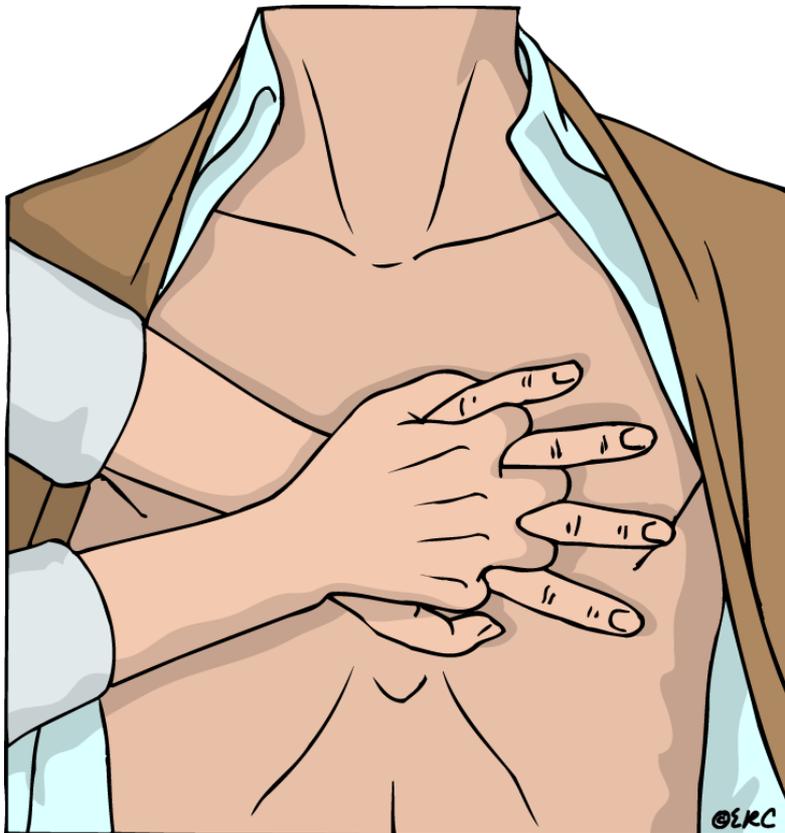
Check breathing

Call 112

30 chest compressions

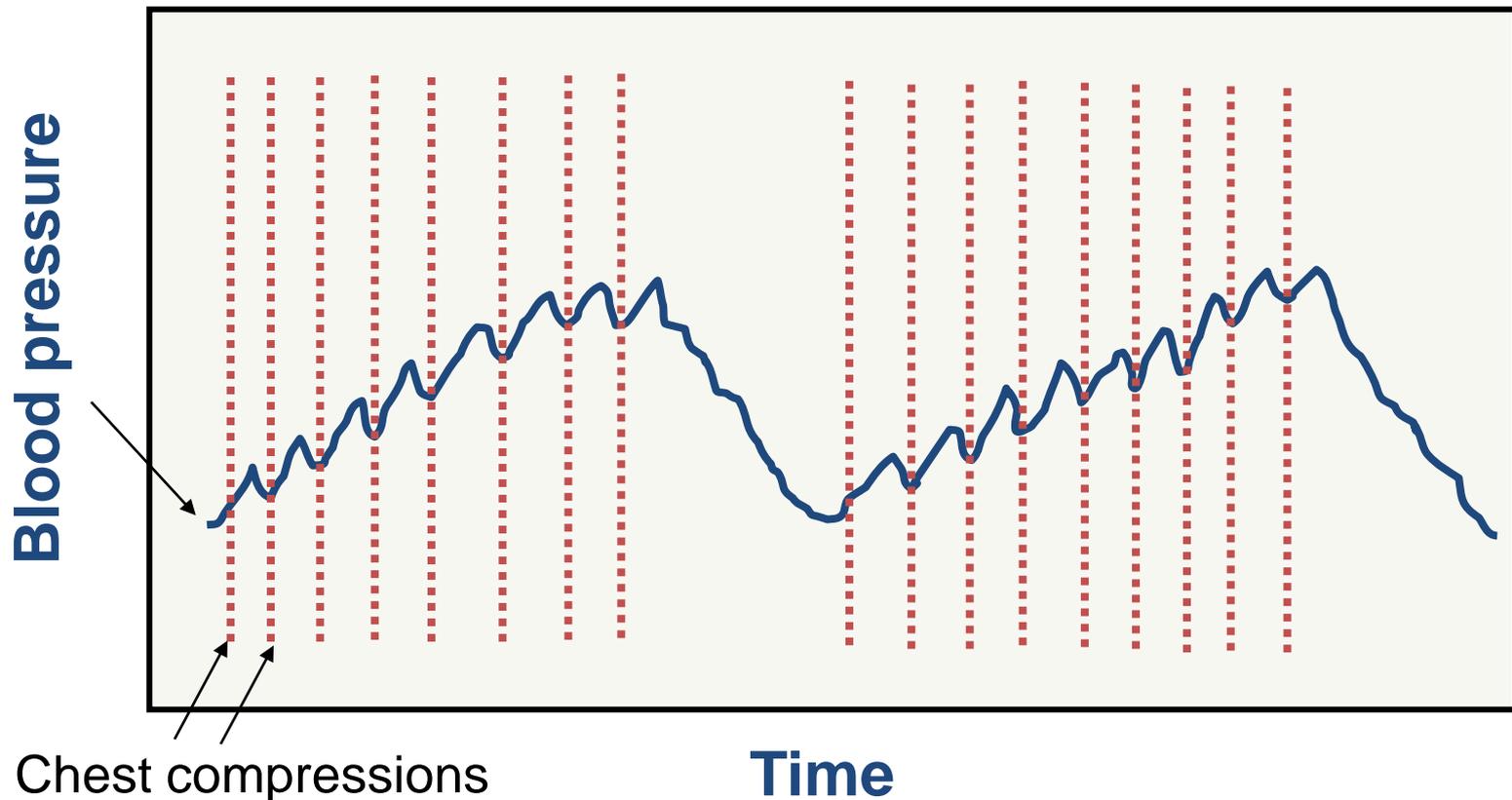
2 rescue breaths

CHEST COMPRESSIONS



- Place the heel of one hand in the centre of the chest
- Place other hand on top
- Interlock fingers
- Compress the chest
 - Rate 100 min⁻¹
 - Depth 4-5 cm
 - Equal compression : relaxation
- When possible change CPR operator every 2 min

Interrupting chest compressions for rescue breathing can adversely affect hemodynamics during CPR for VF



RESCUE BREATHS

Approach safely

Check response

Shout for help

Open airway

Check breathing

Call 112

30 chest compressions

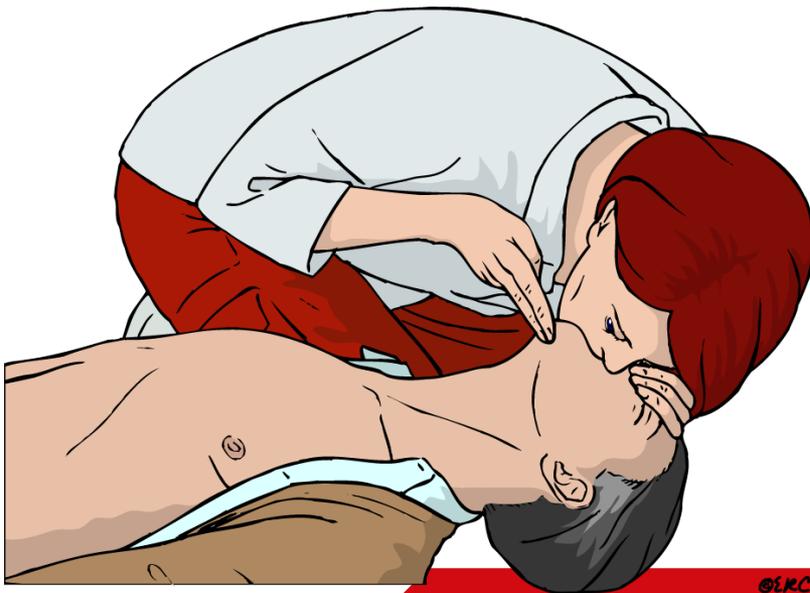
2 rescue breaths



©IRC

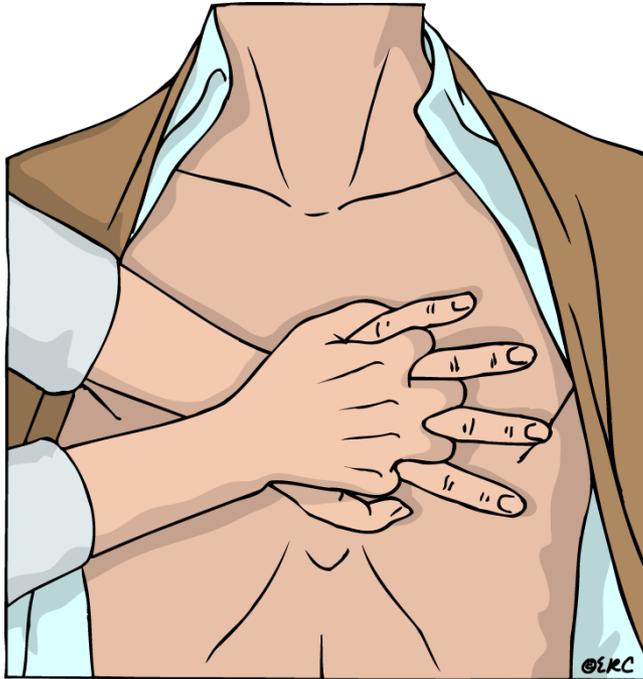
RESCUE BREATHS

- Pinch the nose
- Take a normal breath
- Place lips over mouth
- Blow until the chest rises
- Take about 1 second
- Allow chest to fall
- Repeat

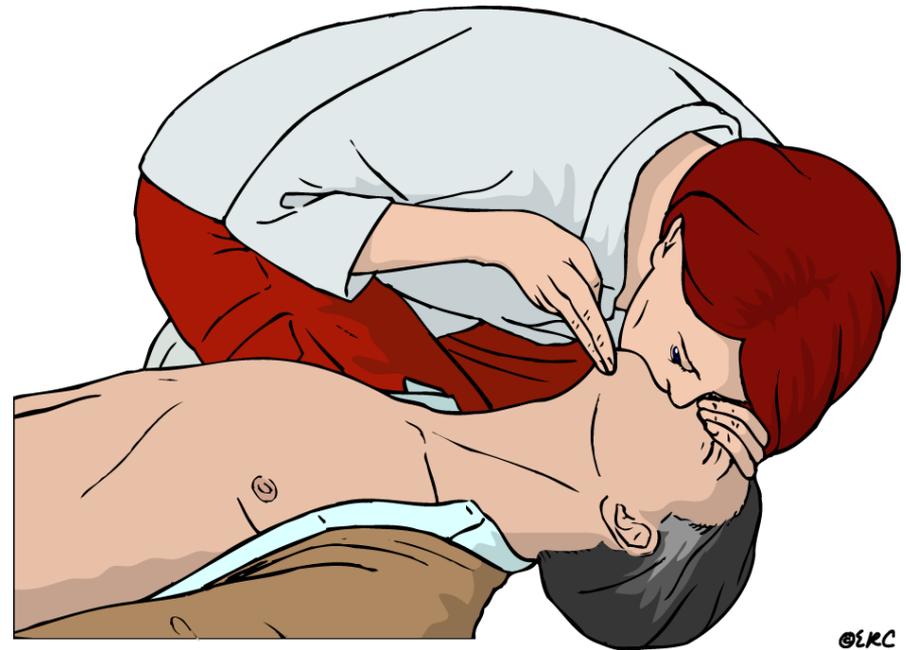


©IRC

CONTINUE CPR



30



2



Approach safely

Check response

Shout for help

Open airway

Check breathing

Call 112

30 chest compressions

2 rescue breaths

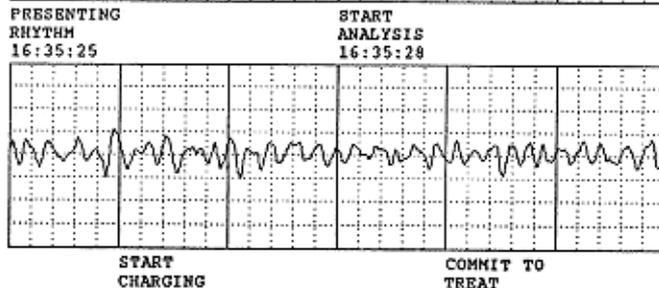
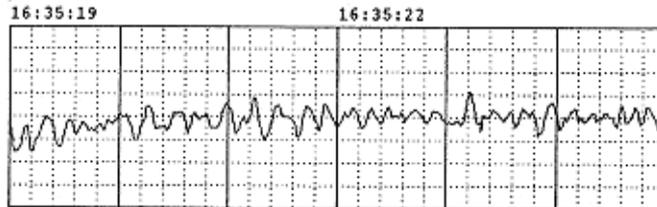


THE NEED FOR DEFIBRILATION

```
-----  
REPORT DATA                                DEVICE DATA  
EPISODE DATE..... 7 NOV 96                SERIAL NUMBER..... 001137  
EPISODE TIME.....16:34:55                  PROTOCOL.....SEMI-AUTO  
SOURCE FORMAT..... MCM                     SOFTWARE VERSION... 2.01  
REPORTED BY... HS REPORTER                 CATALOG NO..... 900005  
SOFTWARE VERSION.. C                       MCM S.W. VERSION... 1.10
```

EVENT LOG:

```
----- 7 NOV 96 -----  
16:34:55 UNIT ON  
16:34:57 START ANALYSIS  
16:35:02 START CHARGING  
16:35:04 UNIT OFF  
16:35:19 UNIT ON  
16:35:22 START ANALYSIS  
16:35:26 START CHARGING  
16:35:29 COMMIT TO TREAT  
16:35:35 READY TO SHOCK  
16:35:38 SHOCK DELIVERED NO. 1 200J  
16:35:44 START ANALYSIS  
16:35:51 NO SHOCK INDICATED  
16:36:33 START ANALYSIS  
16:36:40 NO SHOCK INDICATED
```



- ventricular fibrillation: 80% of victims
- only treatment: electrical defibrillation
- this means: delivering an electric shock with a device called an "Automated External Defibrillator" (AED)



USING AN AED

- a device that delivers electric shocks to victims with cardiac arrest
- analyses the rhythm of the victim and decides when a shock is needed



AEDs have been placed in strategic locations such as casinos, on board of international flights and in major airport terminals, public places, shopping and sport centers

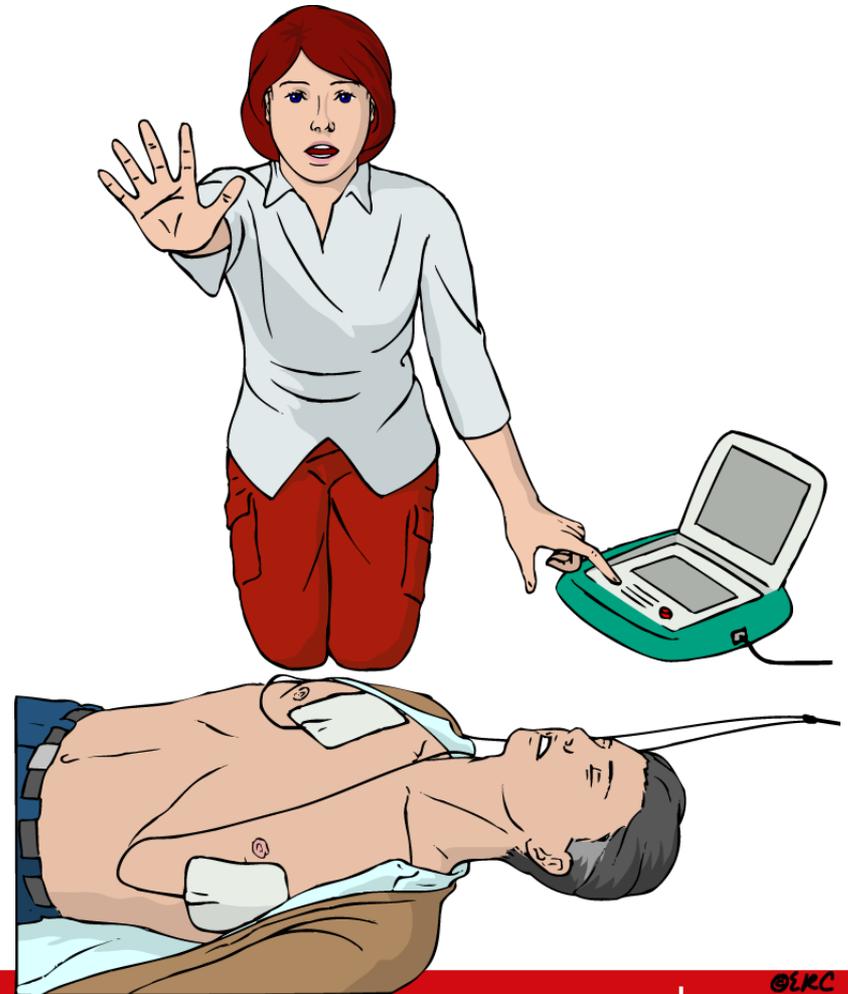
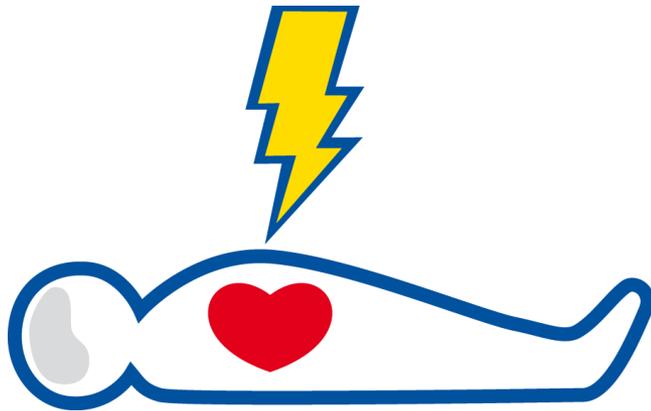


Chicago O'Hare (USA), 18. listopadu 2010



<http://www.fsps.muni.cz/aed/mapa/?lang=en>

DEFIBRILLATION



Approach safely

Check response

Shout for help

Open airway

Check breathing

Call 112

Attach AED

Follow voice prompts

SWITCH ON AED

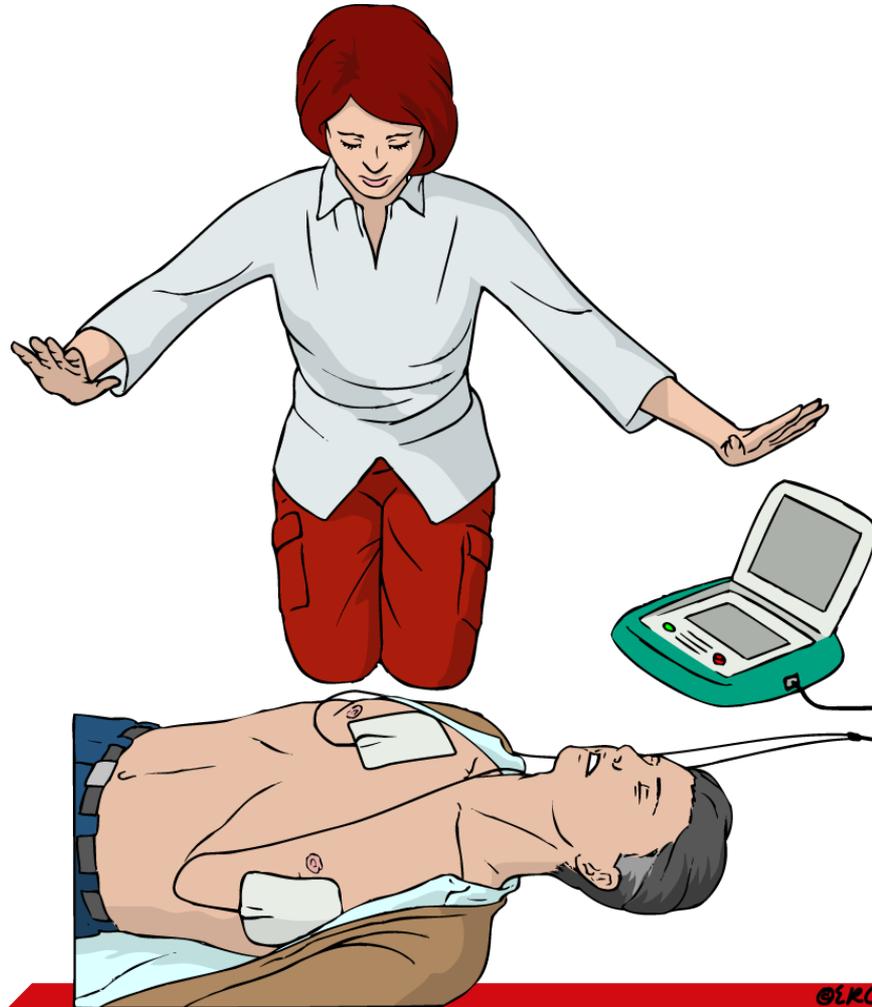


- Some AEDs will automatically switch themselves on when the lid is opened

ATTACH PADS TO CASUALTY'S BARE CHEST

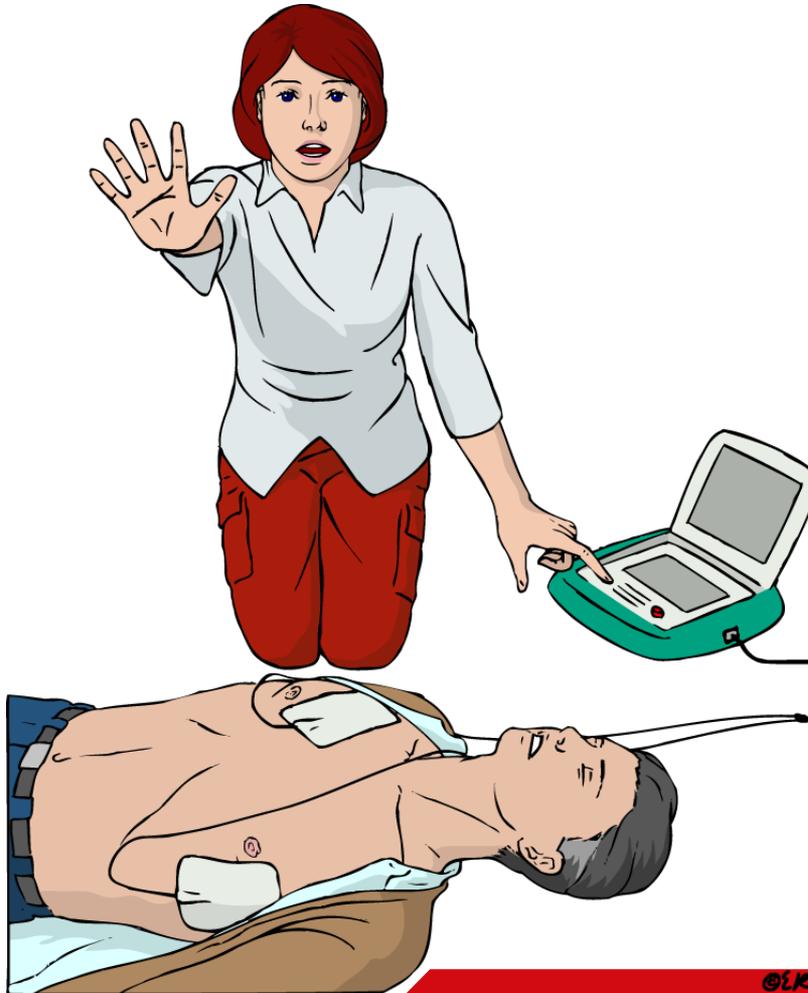


ANALYSING RHYTHM DO NOT TOUCH VICTIM

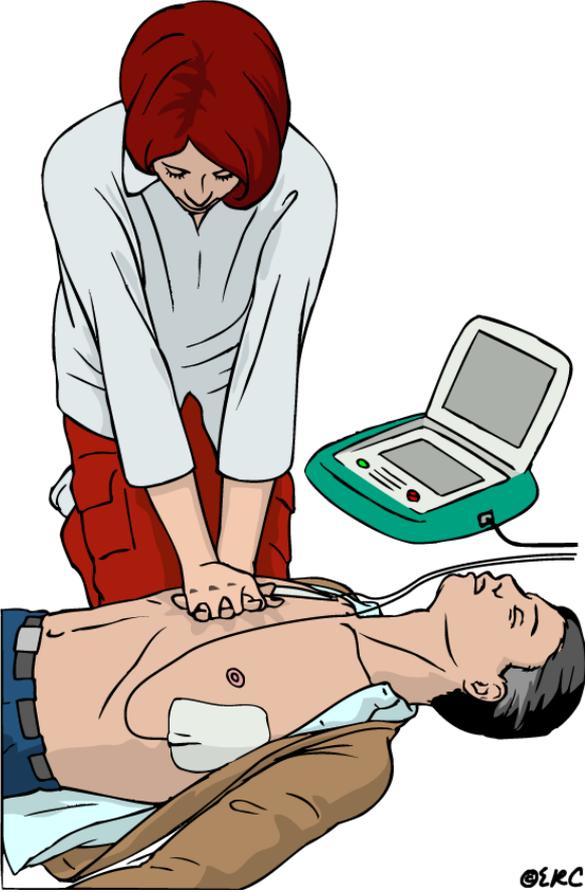


SHOCK INDICATED

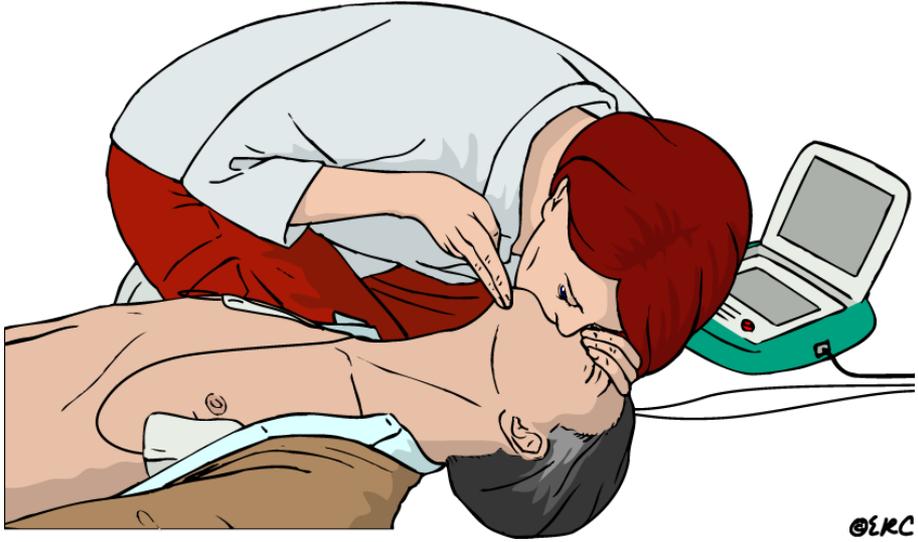
- Stand clear
- Deliver shock



SHOCK DELIVERED FOLLOW AED INSTRUCTIONS



30

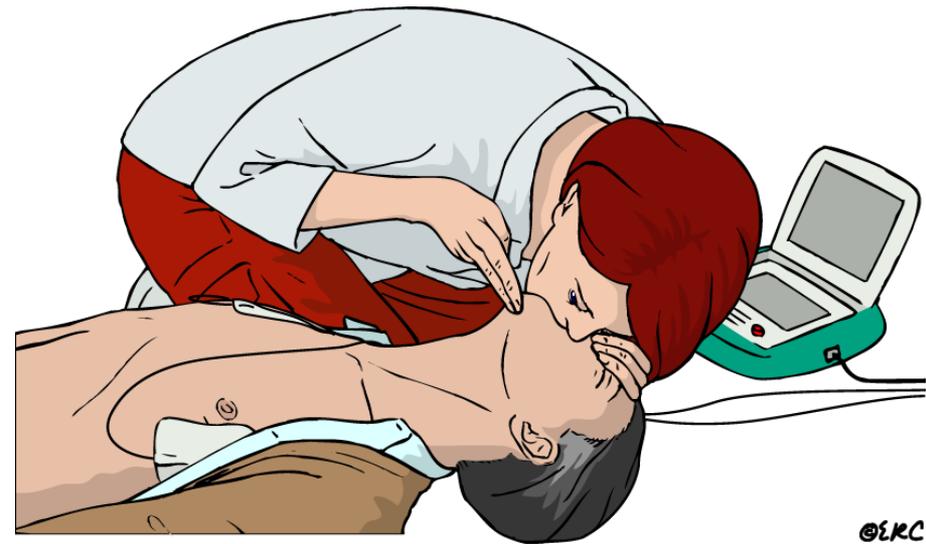


2

NO SHOCK ADVISED FOLLOW AED INSTRUCTIONS

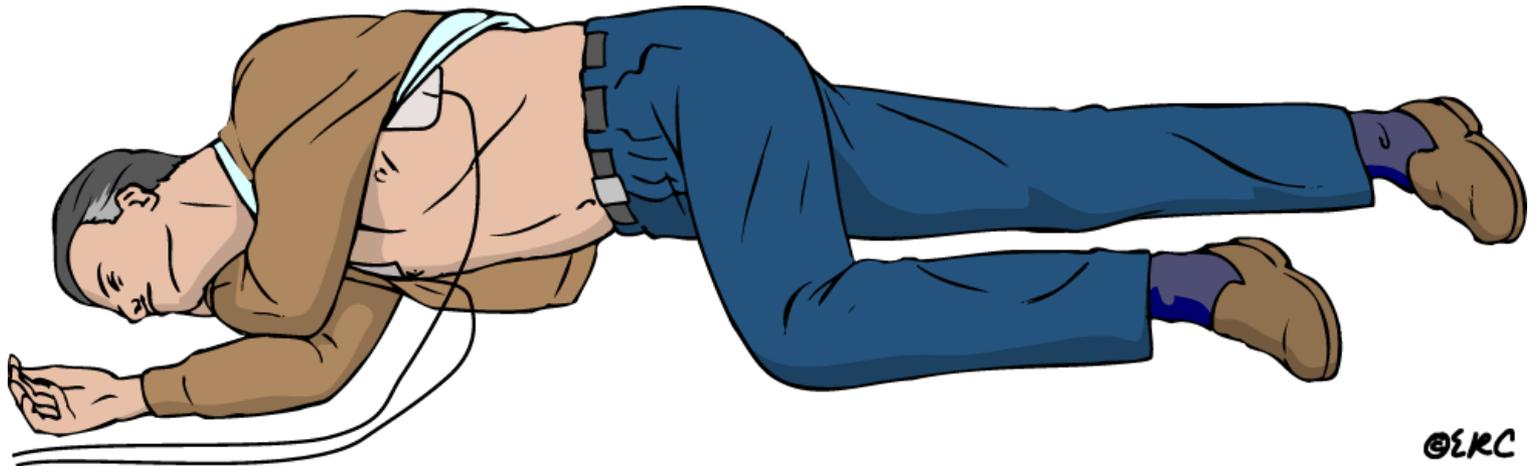


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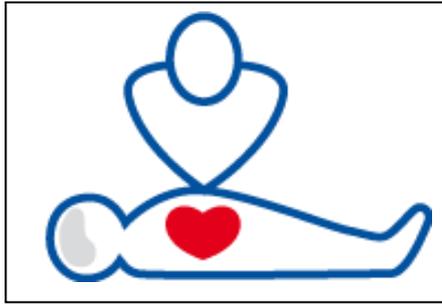
IF VICTIM STARTS TO BREATHE NORMALLY PLACE IN RECOVERY POSITION



CPR IN CHILDREN

- Adult CPR techniques can be used on children
- Compressions 1/3 of the depth of the chest





Approach safely

Check response

Shout for help

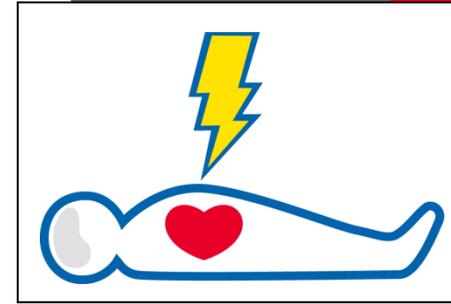
Open airway

Check breathing

Call 112

30 chest compressions

2 rescue breaths



Approach safely

Check response

Shout for help

Open airway

Check breathing

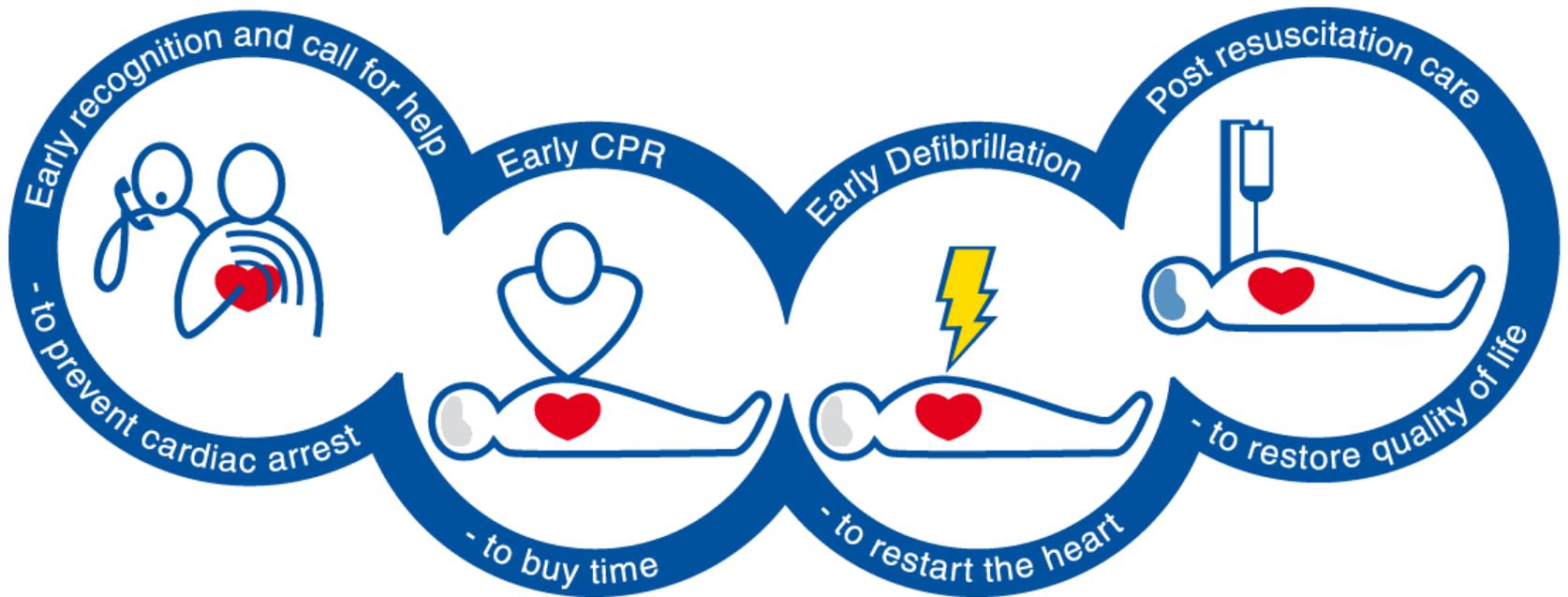
Call 112

Attach AED

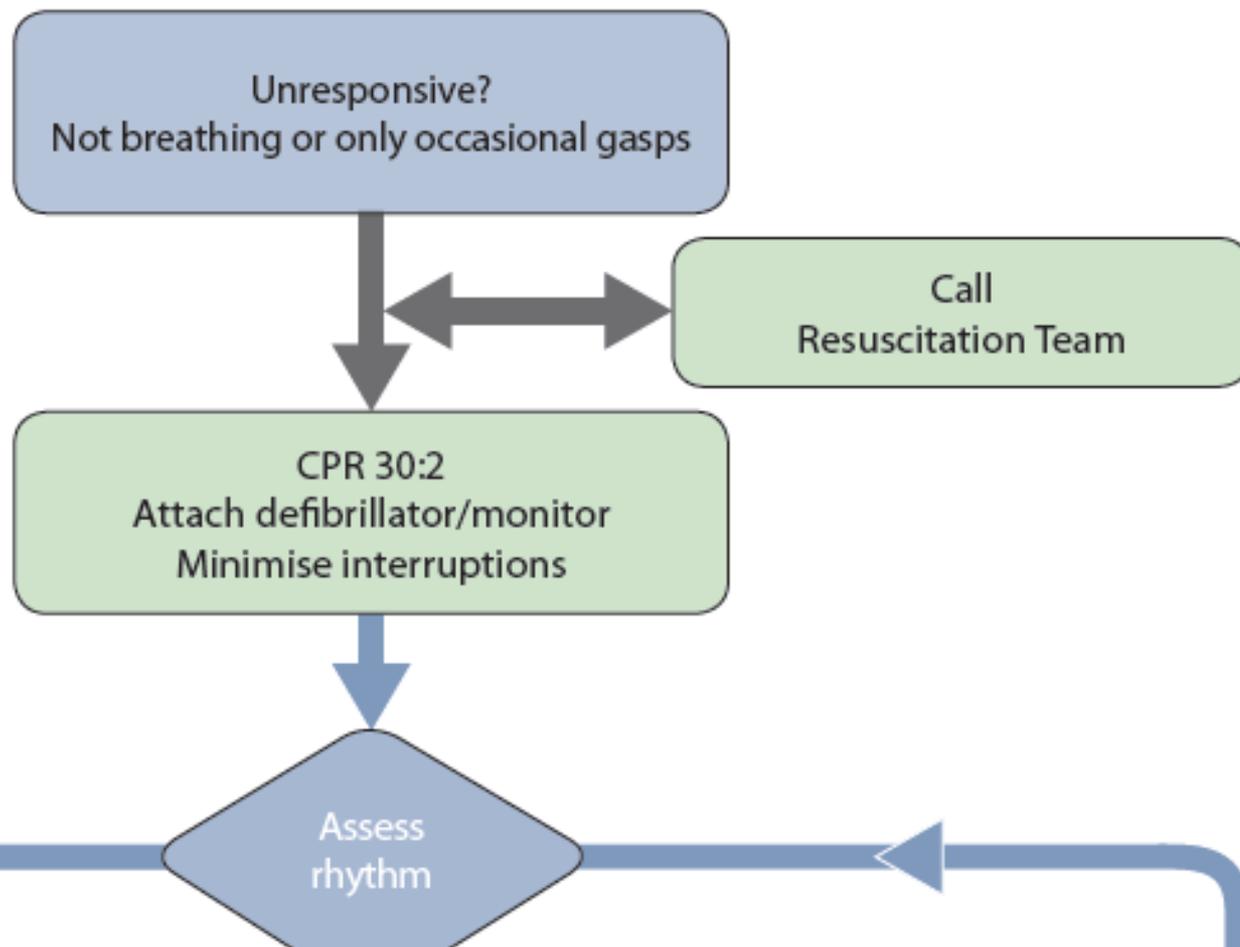
Follow voice prompts



CHAIN OF SURVIVAL



Advanced Life Support Universal Algorithm



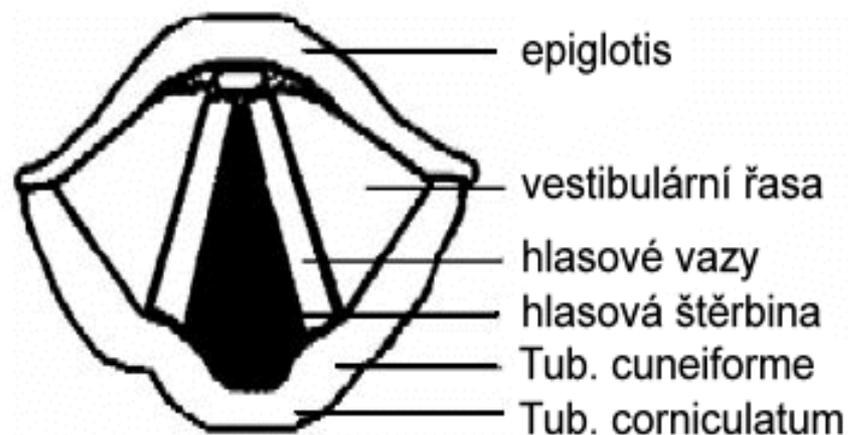
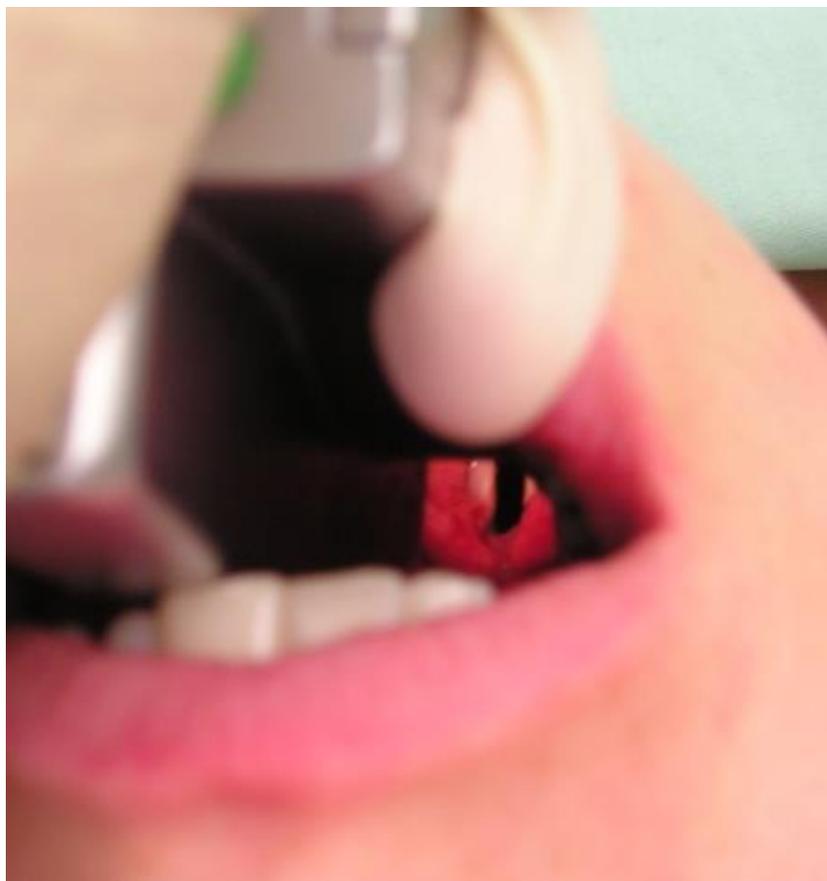
Face mask + ambu



Airway



Advanced airway - intubation

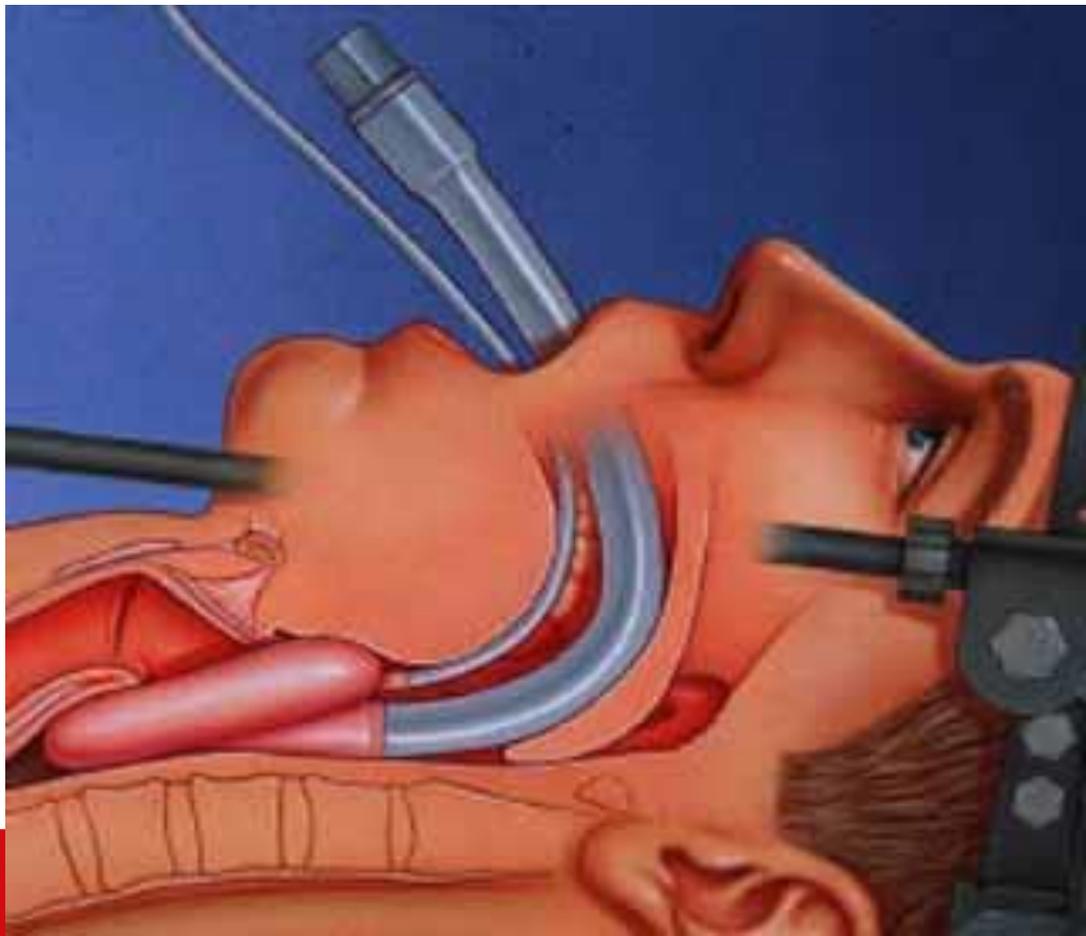
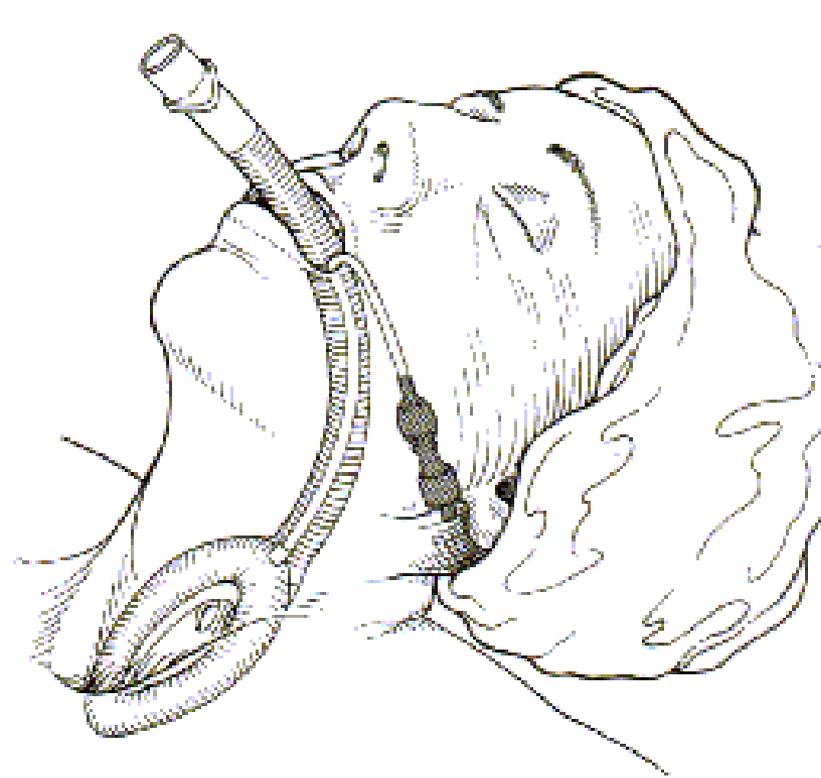




Waveform capnography must be used to confirm and continually monitor tracheal tube placement, and may be used to monitor the quality of CPR and to provide an early indication of return of spontaneous circulation (ROSC).

Supraglottic airway





Portex Minitrach





[LUCAS 2](#)

[Chest Compression System](#)

Heart rhythms associated with cardiac arrest

- shockable rhythms - ventricular fibrillation / pulseless ventricular tachycardia (VF/pVT)
- non-shockable rhythms - asystole and pulseless electrical activity (PEA)

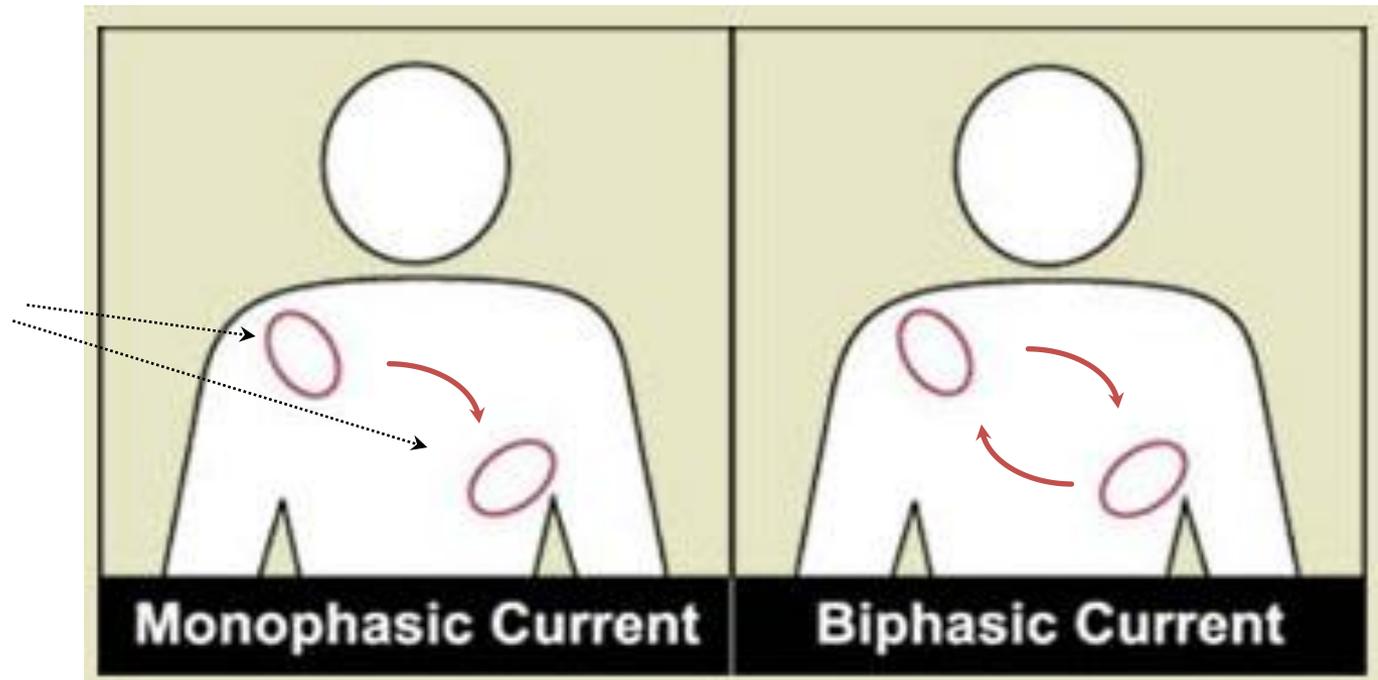
Defibrillation



Shock energy

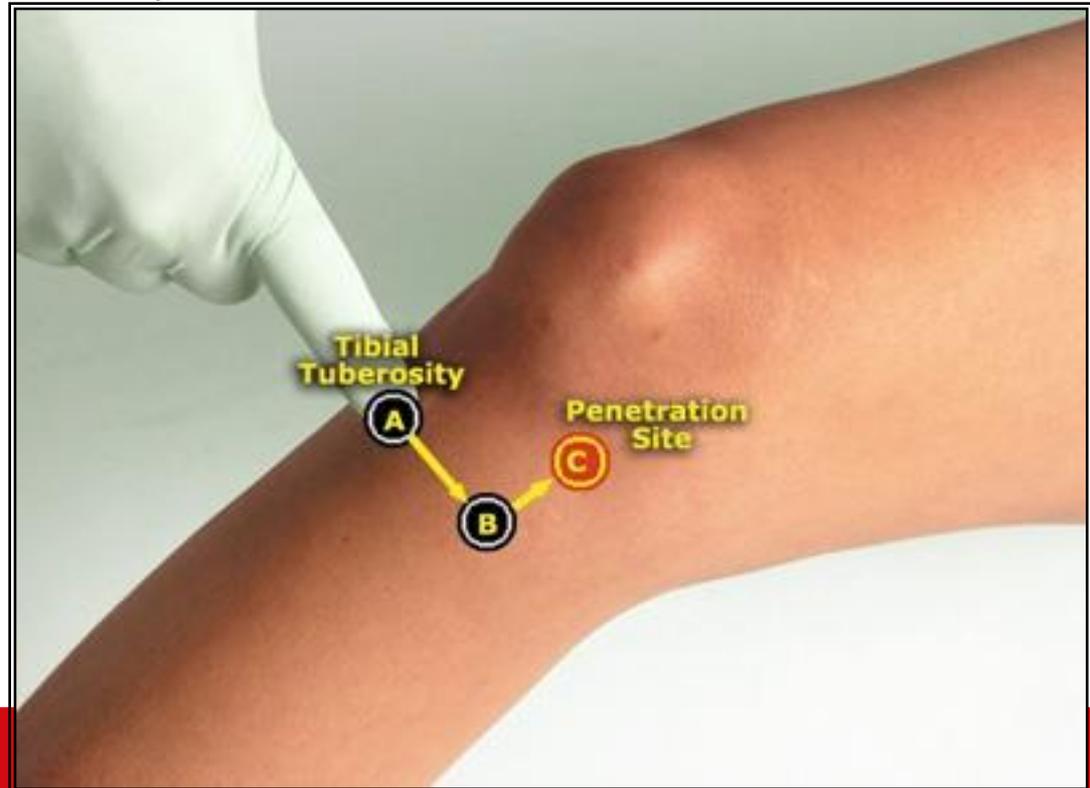
BIPHASIC : 150 – 200 – MAX

MONOPHASIC : 200 – 260 – 360 J



Drugs, fluids ...

- **i.v. lines** (*v.jug. externa*)
- **intraosseal** (*tuberositas tibiae*)



Drugs

- Adrenalin = epinephrine - 1 mg IV every 3-5 min
- Amiodaron – if VF persist after third shock give 300 mg bolus IV (in glucose)
- Atropin – bradydcardia – 0,5-1 mg IV
- Vasopressin / terlipressin - 40IU IV

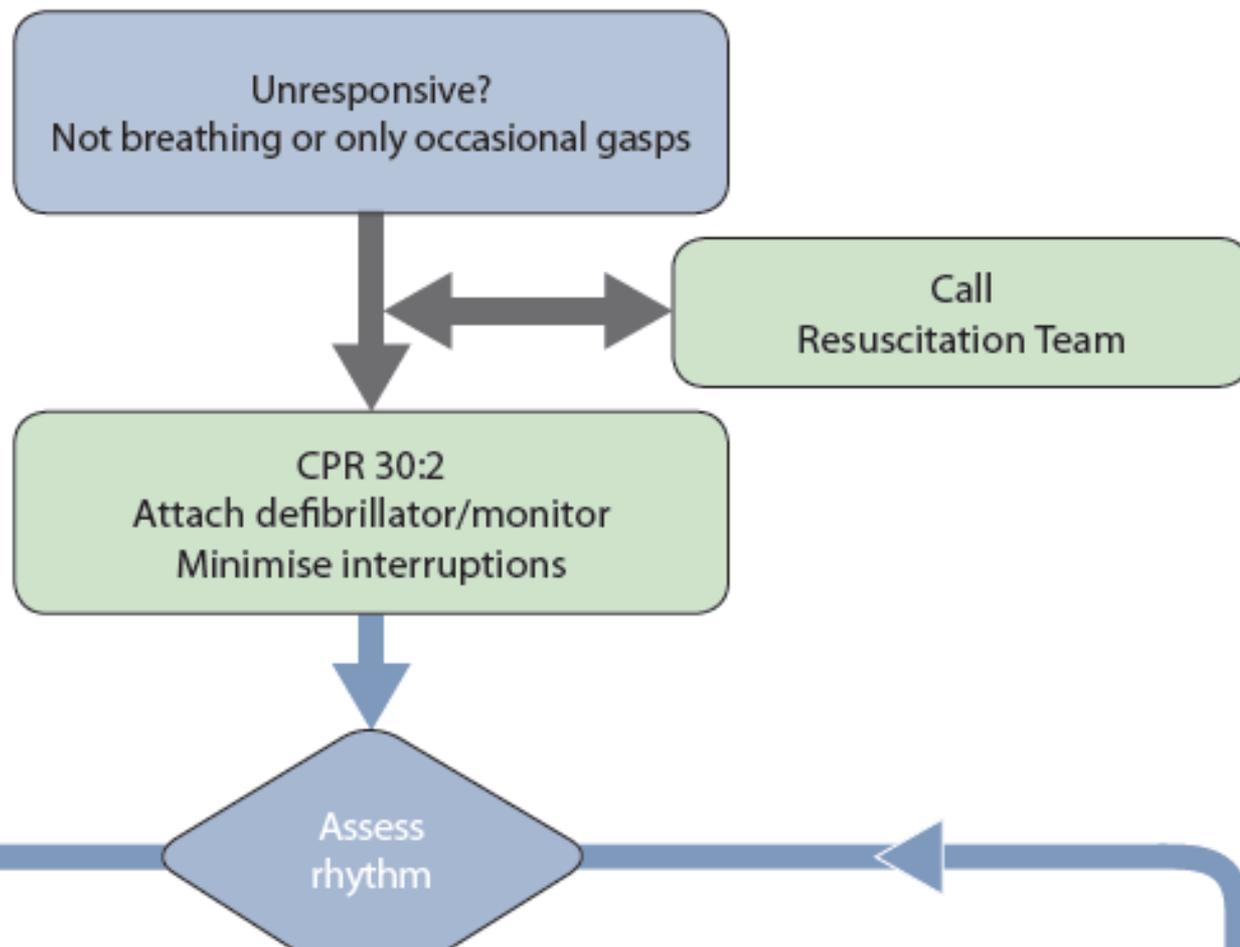
Ultrasound

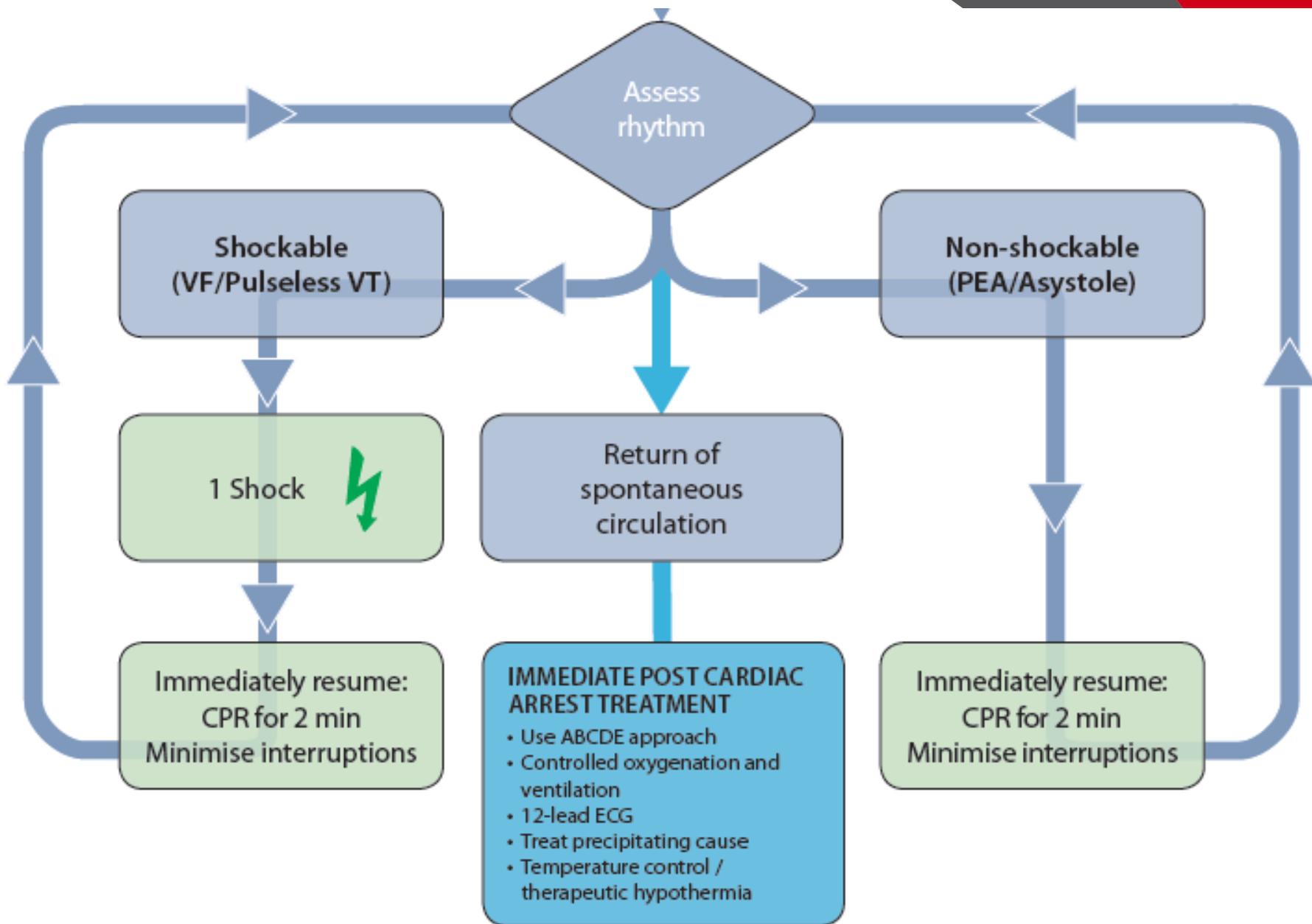
Peri-arrest ultrasound may be used to identify reversible causes of cardiac arrest

- Pulmonary Embolism
- Tamponade
- Hypovolemia
- Ao Dissection
- Pneumothorax



Advanced Life Support Universal Algorithm





DURING CPR

- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3-5 min
- Correct reversible causes

REVERSIBLE CAUSES

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalaemia/metabolic
- Hypothermia

- Thrombosis
- Tamponade - cardiac
- Toxins
- Tension pneumothorax

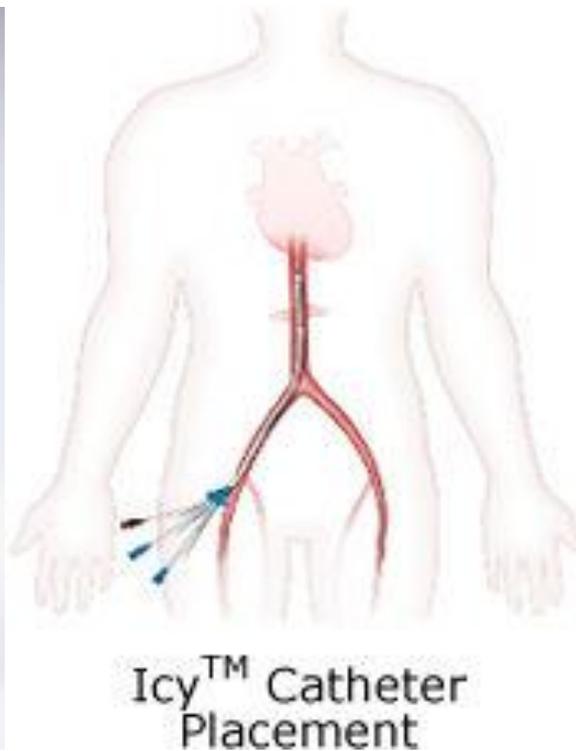
<https://youtu.be/-P-rbof0xv8>

- Drugs and advanced airways are still included among ALS interventions, but are of *secondary importance* to early defibrillation and high quality, uninterrupted chest compressions

Cardiac Arrest Management Demo:
Resuscitation Council (UK)

<https://youtu.be/jQYHQr3ebLo>

Post-resuscitation care at ICU



Ethics

We don't start CPR

- Danger for rescuer
- Devastating trauma
- Certain signs of death
- Terminal condition of disease
- D.N.R. order
- Living will

THANK'S FOR YOUR ATTENTION . . .

